Connection of OWPPs to HVDC networks using VSCs and Diode Rectifiers: an Overview

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Connection of OWPPs to HVDC networks using VSCs and Diode Rectifiers: an Overview

PROMOTioN
PROGRESS ON MESHED HVDC OFFSHORE TRANSMISSION NETWORKS

DTU

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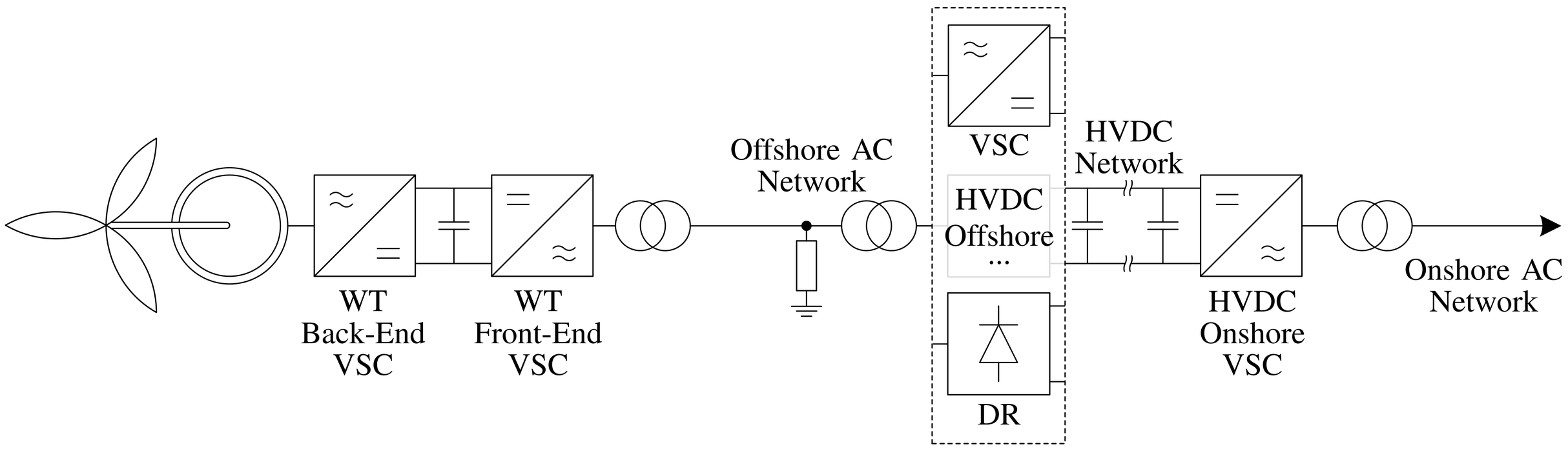
Background, Challenges, Objectives

- Control strategies exploiting type-4 WT converters have been shown to enable the use of DRs for connecting OWPPs to HVDC
- Compared to VSCs, DRs offer advantages such as:
  - Reduced offshore converter station size
  - Reduced losses
  - Reduced investment installation and maintenance costs
  - Increased reliability
- The corresponding control functions have to be delegated to the WT front-end VSCs
- Fundamentally different WT and WPP control schemes are required
- The control philosophy changes from grid-following units to grid-forming units
- The aim is to present an overview of the requirements for connecting OWPPs using HVDC technology
- What are their implications when using VSCs and DRs?

Two Offshore Power Converter Technologies



- VSCs are assumed to be used as the HVDC onshore converters
- *VSCs* or *DRs* are used to refer directly to the technology choice for the HVDC offshore converters
- Thyristor-based LCCs are not considered

Requirements imposed by Onshore AC Networks

- Services to be provided to them via the HVDC networks
- Frequency support
- Active power control
- Power oscillation damping
- AC voltage support
- Fault ride-through

Requirements imposed by DC and Offshore AC Networks

- Support services to help maintaining their stability
- DC-connected power park requirements in ENTSO-E's HVDC Code have been built upon ENTSO-E's RfG Code
- Operational voltage and frequency ranges
- Fault ride-through
- Offshore AC voltage generation

Discussion

- Current requirements are mainly based on those for onshore generation
- They can be more stringent than necessary
- This can hinder the exploitation of some technologies and corresponding cost reductions
- Current requirement paradigm: HVDC offshore terminals are grid-forming units, OWPPs are grid-following units
- This is not compatible with cost-reducing solutions such as DRs, which require the OWPPs to become the grid-forming units
- More in-depth studies are necessary before requirements specific for DR-connected OWPPs can be established

PROMOTioN – Progress on Meshed HVDC Offshore Transmission Networks
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